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Alterations in apomorphine concentration in spinal cord and brain follow the time course of catalepsies induced by different treatments.

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Because evidence for the neurotransmitter role of dopamine in the gray matter of the spinal cord is accumulating, a question arises of whether or not spinal dopamine receptors are also involved in the effects of dopaminomimetics which are believed to induce beneficial effects in Parkinson's disease through an action thought to be mediated mainly by striatal dopamine receptors. To test this hypothesis muscimol and picrotoxin were injected unilaterally into the posterior part of the substantia nigra of rabbits permanently implanted with stainless-steel cannulae. Muscimol (a GABA-mimetic) enhanced locomotor activity, evoked a stereotyped behavior and contralateral rotations, and increased apomorphine-induced gnawing. Picrotoxin, a substance which inhibits GABA transmission, induced ipsilateral rotations, evoked catalepsy and muscle rigidity, and inhibited locomotor activity. Picrotoxin abolished apomorphine-induced gnawing, and increased haloperidol-mediated catalepsy. The catalepsy induced by an intranigral injection of picrotoxin, and the picrotoxin-evoked blockade of the apomorphine-induced gnawing disappeared within 16 h after the intranigral injection. Alterations in the apomorphine concentration in brain structures (n. caudatus and cerebral cortex) and in spinal cord after picrotoxin injection followed the same time course as the behavioral changes, and returned to the control values 16 h after injection of picrotoxin. Apomorphine was always injected 30 min before the rabbits were killed. Moreover, the substantial increase (to 300%) in apomorphine concentration in the spinal cord probably reflects the antagonism between behavioral changes induced by picrotoxin and the haloperidol catalepsy, rather than the decreased apomorphine concentrations observed in the brain structures. We suggest, therefore, that there exists a correlation between the behavioral effects, which are generally accepted as laboratory models of Parkinson's disease, and the enhanced apomorphine concentration in the spinal cord.

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Partial lesion of the substantia nigra: relation between extent of lesion and rotational behavior.

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Recent work, largely carried out in primate models of Parkinson's disease (PD), indicates that residual dopaminergic neurons in the midbrain and their axons to the nucleus accumbens and striatum can be stimulated to sprout collateral axons, reinnervate the striatum, and cause a behavioral recovery. We sought to create a partial lesion model of PD in the rat that would (i) mimic the pattern of cell loss in human patients in early stages of PD, and (ii) permit examination of experimental manipulations that promote sprouting of axons of the surviving dopaminergic cells in the midbrain. Rats with unilateral 6-hydroxydopamine (6-OHDA) lesions of the substantia nigra pars compacta (SNpc) were tested weekly for rotational asymmetry following administration of apomorphine or amphetamine. After completion of behavioral testing, the animals were sacrificed and the brains immunolabeled for tyrosine hydroxylase (TH). Analysis of anatomical and behavioral data revealed a strong correlation between number of remaining TH-immunoreactive cells in the SNpc and the number of rotations induced by apomorphine. There was no significant correlation between number of remaining TH-immunoreactive nigral neurons and number of rotations induced by amphetamine. We also examined the relation between area in the denervated striatum with remaining TH-immunoreactive axons, number of TH-immunoreactive cells in the lesioned SNpc, and rotational behavior. As expected, there was a strong correlation between area innervated by TH-immunoreactive axons and number of remaining TH-immunoreactive neurons in the lesioned SNpc. Total extent of innervation was also correlated with number of apomorphine-induced rotations but not with number of amphetamine-induced rotations.(ABSTRACT TRUNCATED AT 250 WORDS)

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